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ORIGINAL ARTICLES.

THE CONNECTION OF THE GERM THEORY WITH THE ETIOLOGY OF SOME COMMON DISEASES.

By M. L. Pasteur.

When I found myself engaged in the studies which I am at present prosecuting, I was endeavoring to extend the germ theory to certain common affections. When shall I be able to terminate these researches? With the desire to see them completed by others, whose activity they may stimulate, I take the liberty of presenting them so far as I have advanced in them.

Section I.—Upon Furuncles.

In May, 1879, a person working in my laboratory had numerous furuncles, appearing at short intervals, sometimes affecting one part of the body, sometimes another.

Keeping always in view the fact of the immense activity of microscopic beings in nature, the question presented itself to my mind, whether the pus of furuncles did not contain one of those organisms whose presence, development and transmission to various points in the economy, might not stimulate the local inflam-

mation, the formation of pus, and explain the recidivity of the disease for a time variable in length. It was easy to put the idea to the proof of observation.

First Observation.—On the 2d of June, a puncture was made at the base of a small cone of pus, crowding one of the furuncles, situated at the back of the neck. The liquid obtained was sowed to the contact of air, every precaution being taken to exclude foreign germs, either at the time of the puncture, and of the sowing of the liquid of culture, as well as during its continuance in the oven, whose temperature remained constantly at about 35°.

The next day, the liquid of culture had lost its clearness and contained a special organism, formed of little spherical points, grouped by couples of two grains, seldom of four, but often gathered in little masses.

During these experiments, two liquids were selected for use; the bouillon of muscle of chicken, and that of yeast, and the result varied somewhat as one or the other was employed. These variations demand notice. With the yeast, the couples of small grains are spread in all the parts of the liquid, which is uniformly cloudy. With the bouillon of chicken they are gathered in small masses, lining the walls of the vase, and the liquid remains clear, unless it is shaken; in this case it becomes cloudy by the breaking up the little masses spread upon the bottom of the vases.

Second Observation.—June 10th, another furuncle appeared upon the right thigh of the same person. Pus was not yet visible under the skin, but a prominence, red in color, appeared on the surface, of about the dimensions of a twenty-cent coin. The part was carefully washed with an alcoholic mixture, which was dried up with blotting paper which had been exposed to the flame of an alcoholic lamp. A small puncture made on the prominent part produced the collection of some lymph, mixed with blood, which was sowed simultaneously with some blood taken from one of the fingers. The following days the blood of the finger remained sterile, the other, on the contrary, exhibited an abundant culture of the same organism that was formed in the first observation.

Third Observation.—On the 14th of June, another furuncle

appeared on the neck of the same person. The same examination produced the same result, to wit: the development of the already-mentioned microbe; and there was, as before, sterility of the blood obtained from the general circulation, which this time, however, was taken from a point at the base of the furuncle, around the inflamed part.

While making those observations, I had spoken of them to Dr. M. Raynaud, and that gentleman kindly sent me a patient who had had furuncles for the last three months, in order to enable me to still further extend the investigation. On the 13th of June, I tried the culture of the pus of one of the furuncles of this patient. On the next day a general cloudiness of the liquid of culture appeared, still accompanied by the same unique parasite.

Fourth Observation.—June 14th, the same patient showed me an enormous furuncle, forming in the left axilla. The prominence was well marked, together with the redness of the skin, but no pus had yet appeared. An incision of the skin on the top of the prominence, however, gave exit to some pus, mixed with blood, showing an easy culture in twenty-four hours and the re-appearance of the same organism. Blood taken from the arm, at a distance from the furuncle, remained sterile. June 17th another furuncle appeared in the same individual, giving similar results, viz: the development of the same organism in the pure state.

Fifth Observation.—On the 21st of July, Dr. M. Raynaud informed me of a woman having multiple furuncles; indeed, her back was covered with them, some suppurating, others ulcerated. Pus was obtained from those which were not open, and after several hours the sowing of the pus gave an abundant growth, invariably the same organism, always pure without mixture with any other, while the blood taken at the inflamed base of the furuncle still remained sterile.

To resume, it thus seems certain that all furuncles contain an ærobic, microscopical parasite, and that to this are due the local inflammation and the formation of the pus, its legitimate result.

The liquids of culture of the little organism, inoculated under the skin of rabbits and cobayes, give rise to abscesses, gener-

ally small and rapidly healing. As long as recovery is not complete, pus from these abscesses will always show the microscopic organism. It is then there living, acquiring its growth, but its propagation at a distance does not take place. The cultures already mentioned injected in small quantities in the jugular of guinea pigs, have shown that the little organism in question does not grow in the blood, as the day after the injection it cannot be found even by the means of cultures. In a general way, I will observe that ærobic parasites do not easily cultivate in the blood so long as the blood corpuscles are in a good physiological condition. I have surmised that this circumstance may be explained as a kind of a struggle between the affinity for the oxygen of the blood globules and that which is proper to the parasite in its cultures. As long as the blood corpuscles are the stronger, that is, when they take up all the oxygen, the vitality and propagation of the parasite become very difficult, if not impossible. It is then easily eliminated, or, so to speak, digested. I have often witnessed these facts in carbuncular infections, and even in that of the chicken cholera, diseases which are due to the presence of an ærobic parasite.

The culture of the blood from the general circulation in the preceding experiments being always found sterile, it would seem that in the state of furuncular diathesis the small organism does not exist in the blood. That it does not grow, for the reason I have just given, and that it is not abundant in it are all matters of evidence, but we must not conclude absolutely from the sterility of the cultures I have referred to, that the little parasite is not, probably at one time or another carried by the blood and transported from a furuncle in the way of formation, to another part of the body, where it can lodge, grow, and give rise to another furuncle. I am satisfied that if in the furuncular diathesis we could place in culture, not a small drop from the general circulation, but several gramms or more, we should often succeed in obtaining an abundant growth. In the numerous experiments I have made upon the blood of chicken cholera, I have repeatedly obtained proof that at the period when the small parasites of that disease began to rest in the blood, repeated cultures of drops

of that blood, taken even in a single organ, the heart for instance, did not prove equally fecund; this is easily conceded. On one occasion it occurred that out of ten fresh hens, inoculated with infectious blood, which had began to contain the microbe, three died, and seven did not show any signs of being affected. The microbe, indeed, at the time when it began to penetrate the blood, may exist by unity in some small drops, and not at all in others, surrounding. It would then, I conceive, be of great utility to discover a case of furuncular diathesis, in a patient who would allow himself to be pricked in several parts of the body, remote from furuncles already formed, or in way of formation, in order to prepare numerous cultures, simultaneous or otherwise, from the general circulation. I am certain that successful cultures of the small organism of furuncles would be more or less frequently discovered.

Section II.—Upon Osteomyelitis.

For this disease I have only one observation to record, which I owe to the kindness of Dr. Lannelongue. The valuable paper published by him on this disease is already well known, as well as the possibility of its curability by trepanation of the bone, followed by antiseptic washes and dressings. At his request, on the 14th of February, 1880, I visited St. Eugeny hospital, where an operation was about to be performed on a little girl twelve years of age. A large swelling involved the right knee, from the middle of the thigh to a point below the calf of the limb; there was no communication with the surface. The child being chloroformed, a long incision was made below the knee, from which pus escaped freely, the tibia being exposed and denuded to a great extent. The bone was trephined in three places, through each of which the pus flowed in abundance. The pus of the outside and of the inside of the bone was carefully collected, to be afterwards examined and cultivated. The direct microscopic examination of both portions was most interesting. It was evident that they contained in great quantity an organism similar to that of the furuncles by couples of two or four grains, and by masses of these, some with well defined outlines, others less marked, and with

pale conturns. The external pus presented pus corpuscles in abundance, while the internal had none. It was like a greasy paste of furuncular organism. And it is a remarkable fact that in less than six hours afterwards, the sowing of the liquids of culture was followed by the development of the small organism. I saw then that it was exactly that of the furuncles. The diameter of the grains was found to be one thousandth of a millimeter. If I would dare so to express it, I would say that, in this case at least, the osteomyelitis was a furuncle of the marrow of the bone. It would be easy, no doubt, to develop artificially osteomyelitis upon living animals.

Section III.—Upon Puerpural Fever.

First Observation.—March 12th, 1878, Dr. Hervieux had the kindness to receive me in his service at the Maternity, to visit a woman, delivered within a few days, and who was affected with a serious puerpural fever. The discharges were most fetid. I found them full of microscopic organisms of various kinds. From a puncture on the index finger of the left hand, which had been carefully washed and wiped with a *flambé* (scorched) cloth, some blood was collected and sowed in bouillon of muscle of chickens. The following day the culture remained sterile.

On the 13th another collection of blood was obtained from a puncture of the finger. This time it proved fecund. Death having taken place on the 16th, at 6 A. M., it was shown that the blood contained a cultivable microscopic parasite, three days at least before death.

On the 15th of March, eighteen hours before death, blood was taken from the left foot, and its culture proved to be fecund.

The first culture of the 13th contained only the organism of the furuncles; the culture of the 15th contained one somewhat similar to that of the furuncles, but presenting differences easily to be distinguished. Indeed, while the parasite of the furuncles is by couples, or were rarely gathered in little masses of three or four grains, that of the culture of the 15th was in long chapelets, with a variable number of grains. These chapelets were flexible and intermixed together.

The post-mortem took place on the 17th, at 2 P. M. There was an abundant collection of pus in the peritoneum. This was sown with the greatest care, and blood obtained from the basilic and femoral veins was also sown. The pus from the surface of the mucous of the uterus, that of the fallopian tubes, and even that of a lymphatic from the uterine walls was also sown. The result of the cultures was as follows: in all there were long chapelets, as above described, without other organisms, except in the culture of the pus from the peritoneum, which also showed the small pyogenic vibrio, which I have named the organism of pus in the paper I published in April, 1878.

Interpretation of the Disease and of the Death.—After delivery, the pus which naturally forms in the wounded parts of the uterus, instead of remaining pure, became mixed with microscopic organisms from outside, especially with that in long chapelets of grains and with the pyogenic vibrio. These had passed into the peritoneum through the fallopian tubes, and some of them into the blood, probably by the lymphatics. Absorption of the pus, always very easy and rapid when pure, became impossible from the presence of the parasites, whose existence ought to have been prevented from the time of the delivery.

Second Observation.—On the 14th of March, at Lariboisiere, a woman died of puerpural fever. The abdomen had become very tympanic before death. By a puncture of the peritoneum, pus was removed in abundance and sown, as well as blood from a vein in the arm. The culture of the pus gave the long chapelets and the pyogenic small vibrio. The culture of the blood gave only pure long chapelets.

Third Observation.—May 17th, 1879, a woman delivered three days previous, was sick, as well as the child she was nursing. The lochia was full of pyogenic vibrio, and of the organism of the furuncles; the latter, however, in small proportion. The milk and the lochia being sown, the milk gave the organism in long chapelets, but the lochia only that of pus. The mother died. There was no autopsy.

On the 28th of May, a rabbit was inoculated under the abdomen with five drops of the preceding culture of the pyogenic

vibrio. The following days a large abscess was formed, which ulcerated on the 4th of June. The pus from it was abundant and caseous. A diffused hardness surrounded the abscess. June 8th, the opening of the abscess was large and the suppuration abundant. Another abscess communicating with the first was forming on the borders. During the whole month of June the rabbit was sick, and the abscesses continued to suppurate, but in diminishing degree. In July, they were closed and the rabbit was cured. The nodosities under the abdomen were gone.

How many disorders in a woman recently delivered may follow the introduction of a pyogenic organism, when by the lesion of the maternal placenta it has been able to penetrate into the peritoneum, in the lymphatics or in the blood! Its presence is much more dangerous than that of the parasitic chapelets. Let us add, that its development is always threatening; for, as I stated in 1878, it can be found in many common waters.

I add, that the organism in long chapelets of grains is not less common than that of its location on the surface of the mucous membranes of the genital parts. There is then no puerpural parasite, properly so called. I have not met with the true septicemia, but it must be amongst puerpural affections.

Fourth Observation.—On the 14th of June, at Lariboisiere, a woman who had been very sick, after recent confinement, died at 12 P. M. A few hours after death, pus from an abscess on the arm, and blood from one of the fingers, were collected and sown. On the 15th the culture of the pus was full of long chapelets of grains. That of the blood remained sterile. Autopsy took place on the 16th, at 10 A. M. The blood of a vein of the arm was sown, as well as the pus taken on the walls of the uterus and that of a collection in the synovial membrane of the knee. All the cultures were fecund, even that of the blood; and all showed the long chapelets of grains. The peritoneum contained no pus.

Interpretation of the Disease and of Death.—The wound of the uterus after delivery had, as usual, furnished pus which gave refuge to the germs of the long chapelets of grains. These, probably by the lymphatics, had passed into the articulations, and

a little all over, giving rise to metastatic abscesses, which became causes of death.

Fifth Observation.—On the 17th of June I received some blood, obtained with great care, from a child who had died soon after birth, and whose mother had had, before confinement, chills and other febrile symptoms. This blood, when cultivated, furnished the pyogenic vibrio in abundance. On the contrary, blood taken from the mother on the 18th, in the morning, (she had died at 1 A. M. during the night of that day), gave rise to no organic development, either on the 19th or the following days. The autopsy of the mother took place on the 19th. The fact is worthy of notice, that neither the uterus, the peritoneum, nor the intestines presented any peculiar appearance; but the liver was filled with metastatic abscesses. Where the hepatic vein emerges, there was pus in the vein, and the walls of the liver at that point were ulcerated. The pus of the abscesses of the organ was full of pyogenic vibrios. The substance of the liver itself, taken outside of the visible abscesses, gave cultures full of the same organism.

Interpretation of the Disease and of the Death.—The pyogenic vibrio formed in the uterus, or rather, which was already present in the body of the mother before confinement, as she had chills, had produced in the liver metastatic abscesses, and being communicated to the blood of the child, it had produced in him one of the forms of purulent infection, which carried him off.

Sixth Observation.—June 18th, 1879, I was informed that a woman confined several days previously, at Cochin, was very sick. On the 20th blood from the finger was sown and remained sterile. July 15th, or twenty-five days later, blood from the finger was sown, but with no development. In the lochia no well-recognized organism was discovered. The woman was, however, said to be very sick. She died on the 18th of July, at 9 A. M., after a long and painful sickness, as it extended back a month and she was unable to stir without great pain. The autopsy on the 19th, at 10 A. M., was very interesting. She had suffered from purulent pleurisy, with a considerable pouch of pus and false purulent membranes on the pleura; the liver was whitish, greasy in aspect, but firm and without apparent metastatic abscesses; the

uterus, quite small, seemed healthy, but on the exterior surface whitish nodosities were found, full of pus. There was no appearance of lesion *in the peritoneum, which was not inflamed*, but there was much pus in the joints of the shoulders and in the pubic symphysis. The pus of the abscesses was sown and gave long chapelets of grains, as well as the pus of the pleura and that of the shoulders, and of a lymphatic of the uterus. The fact is curious, though easily understood, that blood taken from the arm, collected three-quarters of an hour after death, gave a sterile culture. Nothing appeared in the fallopian tubes, nor in the round ligaments.

Interpretation of the Disease and of the Death.—The pus formed in the uterus after confinement had become associated with germs of microscopic organism, which had grown and afterwards passed into the lymphatics of that organ, then giving rise to the formation of pus in the pleura and in the joints.

Seventh Observation.—On June 18th I was informed that a woman had been confined five days previously at Cochin, and that fears were entertained on account of the operation (embryotomy) which had been performed. The lochia sown on the 18th, the next day, gave no fecund culture the day after. Having received no news from the patient since the 18th, I presumed (the 20th) that she must be better. I inquired, and received for answer: "*The woman is doing very well; will be discharged to-morrow.*"

Interpretation of the Facts.—The pus naturally formed on the surface of the wounded parts had not been mixed with outside organisms. *Medicatrix naturæ* won it; that is to say, that life on the surface of the mucous membranes had prevented the development of the foreign germs. Pus was easily resolved, and a recovery took place.

Will the Academy, in closing, allow me to lay before it some ideas that I am disposed to consider as legitimate deductions from the observations I have had the honor to relate?

Under the designation of *puerperal fever*, are placed various diseases, but all seem to be the consequence of the development of common organisms, which by their presence infect the pus naturally formed on the surface of the wounded parts, and which

from their spread under different forms and in various ways in the blood or lymphatics in a certain part of the body, give rise to morbid forms, varying with the state of those parts, with the nature of the parasites, and the general constitution of the subjects. Whatever may be this constitution, does it not seem that in resisting the production of the vulgar parasitic organisms, recovery might take place in all cases, except perhaps from those which the body would already contain before confinement, by the presence of impure abscesses, internal or external, or microscopic organisms, as we have seen in a preceding example, (fifth observation). The antiseptic method seems to me to be powerful in the great majority of classes. It appears to me that *immediately after confinement* one ought to commence the applications of these antiseptics. Carbolic acid may be very useful, but there is another antiseptic which I would recommend; it is boric acid, in concentrated solution, at ordinary temperature, that is 4 p. 100 about. This acid, whose singular effect on the life of cells has been shown by Mr. Dumas, is so slightly acid that it is even of alkaline reaction, with some proof papers; besides which it is odorless, thus differing from carbolic acid, whose odor is so offensive to patients. Again its innocuousness upon mucous membranes, especially the vesical, is every day tested in our hospitals. Here is the occasion where I first used it. The academy will remember that I have shown, and it has not been disproved, that ammoniacal urines are always produced by a microscopic organism, resembling much, in several particulars, that of furuncles. Later, in common with Mr. Joubert, we found that a solution of boric acid was fatal to that organism. From that time and since 1877 I have advised Dr. Guyon, surgeon at Necker, (section of genito-urinary diseases,) to try the injections of solutions of boric acid in diseases of the bladder. I have reports from him that he has obtained thus far excellent results from it. He has even told me that he never performs lithotrity without such injections. I speak of these facts only to show that boric acid is inoffensive to a very delicate membrane; indeed, the bladder can be safely filled with a tepid solution of boric acid.

To return to confined women: Would it not be very useful to

have near the bed of each patient, easy to reach, a concentrated warm solution of the acid, with compresses that could be often changed, to be used from the time the labor is finished? It would also be prudent to have those compresses previously warmed, to say 150°, a heat more than sufficient to kill all the germs of vulgar organisms. Were I sufficiently authorized to name this communication as I did, (I have stated the facts as they were reported to me and have mentioned my interpretations), still I know that in medical investigations it is difficult to avoid interference with preoccupied ground. Again, I do not forget that medicine and veterinary science are strangers to me. For this I ask the judgment and comment of this illustrious society. Indifferent to frivolous and capricious objections, and with just contempt for the vulgar scepticism which adopts doubt as a habit, I look towards the militant scepticism which properly makes doubt a stimulus to inquiry, and whose rule of conduct has for its motto: "more light." I am pleased to thank Messrs. Chamberland, Roux and Doleris for their kind assistance in collecting the observations I have now presented.

EDITORIAL.

MEETING OF UNITED STATES VETERINARY MEDICAL ASSOCIATION.

The good city of New York, the great metropolis of our great country, was quite recently the seat, by previous appointment, of the annual meeting of the American Medical Association. The occasion proved, in every way, a magnificent success, as well through the large numbers of delegates in attendance from all parts of the country, as in the number of excellent papers which were brought before the different sessions of the Association.

In a few weeks. a somewhat similar gathering will again take place in this city, viz: the annual meeting of the *United States Veterinary Medical Association*, at which, also, many members will doubtless be present, and where, we hope, the profession will be well and largely represented.

Entering on its 17th year, the Association has effected much good. It has created amongst its members relations of professional friendship which have proved most pleasing, and has brought together veterinarians from different parts of the country, and no doubt much benefit has been derived by the members from the annual reunions.

As the Association grows older, and as the number of veterinarians increases in the country, the number of its members must also increase, and the existence of the Association and its works cannot fail to prove, in time, one of the foundation stones upon which American veterinary science will be established.

Of the works done by the Association, perhaps none can be considered more beneficial than the establishment of its organ, the AMERICAN VETERINARY REVIEW. This publication, now in its fourth year of usefulness, has slowly but surely made its way to the favor of the profession, and has acquired a position that enables us to say that to-day our European brethren are looking upon it as the representative of veterinary medicine in America.

We are not aware of any special work, or of any special paper, or subjects, which are likely to be brought before the meeting; but we hope there will be such. There are few items of general business to be attended to, and the work of the *comitia minora* will occupy but a very short time. We must therefore look for interesting productions from the members who intend to be present, for the profitable appropriation of the time.

There are many important questions which may with great propriety be brought under the notice of the Association. The General Education of Veterinarians is one; General Sanitary Medicine is another; a Revision of the Laws of Soundness might not be out of place; and how many others? Then again, we have the matter of the prizes which are offered by the Association for the best essays, which, we hope, will not be ignored, notwithstanding the unfortunate determination of last year's attempt.

Taking it on the whole, there is for such a meeting plenty of opportunities for good and honest work, and it becomes the officers of the Association, President, Secretary, and Chairmen of Committees, to see that our friends who come from long distances

shall not return home without having derived great satisfaction and profit from their visit to New York.

We would call the attention of veterinary book buyers and students to the advertisement of Mr. W. R. Jenkins, who, we happen to know, can fully supply all demands for veterinary literature. Recognizing the importance of the profession and its requirements in the way of standard works of reference (too few of which are published), he has made a specialty of this branch of book selling and publishing, and has gathered together the largest assortment of books relating to domestic animals to be found in any book-store in the country.

The gelatine capsules advertised in the REVIEW by H. Planten & Son have proved in our hands an excellent vehicle for the administration of medicine to our large animals. For those who prescribe volatile compounds, they will be found very excellent and practicable, and more eligible than the usual covering of paper. They are certainly worthy of a trial.

HUMAN AND ANIMAL VARIOLÆ: A STUDY IN COMPARATIVE PATHOLOGY.

BY GEORGE FLEMING, F.R.C.V.S., ARMY VETERINARY INSPECTOR.

(*From The Veterinary Journal, London, England. Reprinted from the Lancet for January 31st.*)

The recent conference held in London on Animal Vaccination will not have been without a useful result, if it has been the means of not only drawing attention to this particular subject, but also to the very meagre knowledge we seem to possess with

regard to variola in animals, and, indeed, of all animal disorders which are communicable to mankind, and *vice versa*. The discussions which took place at the meetings of the conference afforded another proof of the necessity of instituting what I have for years maintained should form a branch of medical study —a chair of comparative pathology at each of our medical schools. Surely a knowledge of animal diseases, in their relation to those of our own species, is of far more moment to the surgeon or physician in the practice of his profession, than an acquaintance with zoology or comparative anatomy. Such chairs are established in nearly all, if not all, Continental medical schools, in which their value has long been recognized. Why is it, then, that we are so slow or so unwilling to adopt what is so manifestly and so urgently required in order to complete the student's education, and to render him a more useful and enlightened member of society.

From the opinions expressed at the conference, as well as elsewhere, I gather that the view is largely entertained among medical men in this country, that human and bovine variola, or vaccinia, are one and the same disease: the latter being dependent for its origin and maintenance upon the former, though undergoing a certain and special modification in the passage of its virus through the organism of the ox; so that, when re-transplanted in the human species, it is no longer small-pox, though it offers protection, partially or wholly, permanently or temporarily, against an attack of that malady.

It would also appear to have been accepted by those present at the conference, that there are only two distinct kinds of variola—one affecting man, and the other the sheep. And one opponent of animal vaccination, in dwelling upon the dangers likely to attend that operation, pointed out the existence of several diseases which, he asserted, bovines are liable to, and which he would lead us to infer might be communicated to those vaccinated direct from the calf. Among the diseases he enumerated were contagious pleuro-pneumonia, anthrax, glanders, certain disorders due to helminths, and "entozootic asthma."

Now, without at present claiming to be a supporter of animal

vaccination, I may as well state that the apprehended danger from these disorders is more or less purely imaginary. Contagious pleuro-pneumonia is peculiar to cattle, and cannot be transmitted in any form to other species, not even by direct inoculation of its morbid products; glanders is not a bovine disease, and all attempts to convey it to the ox tribe have invariably failed; anthrax runs its course too rapidly, and is too marked a disease to be considered in connection with animal vaccination; the worm disorders have no relation to the subject under discussion; while as for "entozootic asthma," why, I never heard of it before, and I fancy nobody else, so that it may also be dismissed as unworthy of consideration. Candidly speaking, if I anticipated any danger in animal vaccination, from the presence of constitutional disease in the vaccinated calf—which I do not at present—I would rather be inclined to look upon the existence of tuberculosis with some suspicion; but this serious malady the speaker did not refer to. There is, however, no evidence that it can be conveyed to mankind by retro vaccination; and, to my mind, the risk is so infinitesimal, considering that the calf is so rarely affected with the disease, at least in an active form, that I think it may not be taken into account just now.

Of infinitely greater importance is the relationship between human small-pox and cow-pox, which was treated as a merely collateral subject at the conference, but was, nevertheless, made the occasion for some strong opinions being expressed as to the absolute identity of the two maladies. The solution of the problem as to whether small-pox and cow-pox are one and the same disease, modified only in their manifestations by differences in the organism of man and the ox, or whether they are distinct and independent disorders, having only a family or generic resemblance, well deserves the most serious efforts; constituting, as it does, a question of the very highest scientific and practical interest, and one about which there should be nothing speculative. Its practical aspect more particularly invites examination, for if it be demonstrated that the two are identical, the cow-pox being derived from small-pox, then there is no occasion to hesitate as to the selection of vaccine lymph; for we might, without compunc-

tion, take that which is directly elaborated in cows through inoculation with the small-pox matter of man, and thus save all the search and precautions at present imposed upon us in order to obtain a vaccine fluid which shall be innocuous, and at the same time sufficiently potent to afford protection from variola. But if, on the contrary, the small-pox communicated to the cow retains all its characters, and when again transferred to mankind merely reproduces itself in its dangerous, general eruptive and highly infectious form, then recourse to variolo-vaccination would be a serious and reprehensible step, and one which should be opposed. Or if the small-pox virus, in passing through the cow, should still retain its variola-producing attributes, but yet become so subdued as to be as harmless, and still as effective as vaccine, ought it to take the place of the latter altogether, or should it be employed simply as an auxiliary? These questions have been asked before, and I venture to ask them again, as a reply to them is of the greatest moment at this particular time, not only in regard to small-pox, but to other virulent affections. For if, notwithstanding the apparent differences in their characters, the human and bovine diseases are the same in nature, the virus only being beneficially modified or transformed by transference from the one creature to the other, it gives us reason to hope that the virulent principle of other contagious scourges which only attack once in a lifetime, may be similarly attenuated by emigration from one species of animal to another, and still retain its protective influence. But if the human and the cow disease are due to a different virus, and the one has power to neutralize the other, the reciprocal neutralization being greatly to the advantage of the creatures concerned, then also there is good reason for hoping that with other contagious maladies of the same, or even a different type, there may be discovered a similar means of destroying their germinative power.

Notwithstanding the immense importance of the question, the long time that has elapsed since vaccination was introduced, the multitude of works upon the diseases, and the great opportunities that have been afforded for clinical and experimental observation, it is indeed astonishing to find opinions still divided on

the subject of human and animal variolæ and their relationship. Strange it is to note doubt and hesitation, and unfruitful discussions as to the nature, advantages, and dangers of vaccination, when we reflect that it has been practised for ninety years, and is universally adopted all over the world as a prophylactic against one of the direst of the pestilences which haunt the human family.

But so it is; and, as before observed, the tendency among medical men, at least in this country, appears to be in favor of small-pox and cow-pox being due to one and the same virus; in opposition to the Jennerian doctrine, that the cow-pox was derived from horse-pox, and had none but an antagonistic relationship to human variola. Their belief seems to be founded on the reports of certain experiments performed by four or five persons (Gassner, Thiele, Sonderland, Badcock, Ceely), in which positive results were obtained some forty or fifty years ago, and on accounts of a few instances in which small-pox was said to have been communicated from sick people to animals. Jenner, according to this opinion, was mistaken; his cow-pox was not derived from "greasy-legged" horses, but from the small-pox-stricken people who went about and handled the milch cows, and so infected or inoculated them. It follows that only cows were (and are now) affected; that cow-pox was much more prevalent in those days than now, because small-pox was more prevalent; that only mankind and sheep have a distinct variola of their own, for the simple reason that those who entertain this opinion never saw or heard of any other species being affected with variola; that failures in recent attempts to produce cow-pox, by inoculating cattle with small-pox virus, and the production of small-pox when the matter of the eruption was transferred from the cows to children, were due to the human virus being merely deposited in a little pouch in the animal's skin, where it did not undergo the supposed modification; and that, though all recent experimenters have failed in developing cow-pox from small-pox, yet at the period mentioned it was accomplished without difficulty.

Deeply impressed with the vast importance of arriving at the truth in such a grave question, I have for many years devoted much attention to it, and have already done what in me lay to

settle it: at least as far as the variolæ of animals are concerned, as will be seen on referring to my work on "Veterinary Sanitary Science and Police" (vol. ii., p. 28); and I will now venture to dispute every one of the arguments brought forward to prove that human variola and cow-pox are due to the same virus, or are the same disease; or that there are only small-pox and sheep-pox as distinct variolæ. With regard to animals, I may at once state that I believe every species has its own independent and particular kind of variola, and I am unable to understand why man and the sheep should alone have the unhappy privilege of being the special subjects of different forms, and this privilege be denied to all the other creatures.

Whether these forms may have been originally derived from a common or primitive source or type, I will not now stop to inquire; but that they exist and compose a group of diseases rather than one malady, cannot be matter for doubt. That they more or less widely differ from each other, that in each species each form has a special character, and though that which is particular to one species may be transmitted to another species, yet the variola of this species need be scarcely a subject for dispute; while the fact that their differences are marked, not only with regard to their particular features, but also as to their capability of transference to other species, and their antagonism to each other, has been clearly demonstrated. Admitting that which I shall presently attempt to prove, that the cow has its own variola, we know that when this is communicated to man it does not produce small-pox, though it protects from it. The sheep-pox has been inoculated on man by many experimenters—among others, by Marchalli, Sacco, Voison, and Hering, but only a small localized group of pustules, quite unlike the eruption of ovine variola, has appeared at the seat of inoculation, and no protection from small-pox or vaccinia has been conferred. Neither human variola nor yet vaccinia will give rise to sheep-pox, neither will their inoculation protect the sheep from its own variola. Horse-pox is communicable to the cow and mankind, and protects them from their variolæ, as well as the human species from vaccinia, while vaccination protects the horse from its pox. As we shall

see immediately, though the virus of human small-pox, when deposited in the skin of the cow, does give rise to a local papulation—often very trifling, exceptionally very marked—yet this is not the regular eruption of cow-pox, either in its appearance or course, and it does not prevent the cow being successfully vaccinated at the same time, though it appears to destroy the aptitude to receive vaccinia; while in two or three transmissions through the bovine species it becomes altogether impotent. The same results are observed in the horse, which, however, appears to receive the virus of human small-pox more readily, and to exhibit more marked local phenomena than the ox; while this inoculation also protects it partially, if not entirely, from the action of vaccine virus, which it otherwise so readily receives. As in the ox likewise, the small-pox virus soon loses its potency in being carried from one animal to another—it cannot be cultivated in them; and experiment has demonstrated, that no more in the organism of the horse than in that of the ox can human variola be transmuted, but that after passing through the bodies of solipeds, and again transferred to man, it has lost none of its characteristic features.

Cow-pox can be very readily transferred to man, the ox, horse, and goat, the first three showing an equal aptitude for its reception; in them also the transmission of the disease is indefinite—*i. e.*, the virus may be cultivated, without impairment, for a limitless number of generations, and it confers immunity against the variola of man and the horse, while the ox itself is protected. But while vaccination only produces in man and the ox a local and limited eruption, in the horse it often produces a startling pustular exanthem, which, in character and seat, differs in nothing from natural horse-pox. Another peculiarity in the action of the vaccine virus in the horse is its tendency to produce this vaccinal eruption, and at the same time to confer immunity, when introduced directly into the lymphatics or blood-vessels; while in the ox it does neither under this condition—all circumstances which would lend support to the opinion of Jenner, that the horse is really the true source of natural vaccinia.

Vaccination in the dog usually only produces small red nodules at the punctures, but nothing at all resembling the vaccinal erup-

tion. It is the same with the pig. In the sheep a small papule generally forms at the seat of inoculation, with rarely a little vesicle that rapidly becomes encrusted. Re-vaccination from this to calves gives negative results.

Not only in their special characters do the variolæ of man and animals differ, but also in their apparent mode of extension. Human variola and sheep-pox differ widely from each other in some respects, particularly in their not acting antagonistically, and in the appearance of the eruption, but they are identical so far as their diffusion is concerned. They are both infectious and contagious, and can be transmitted by fomites, as well as by actual contact; while their virus possesses a vital resistance somewhat remarkable. Cow-pox, horse-pox, and the variolæ of other animals would appear to depend for their dissemination upon their contagious properties only, and their virus readily becomes deteriorated.

There are other peculiarities in the variolæ of man and animals which still further differentiate them, but these I shall not allude to here; so pass on to the consideration of the far more pressing question as to the identity of small-pox and cow-pox, and an examination of the arguments brought forward in support of this identity. But before doing so, I may as well confess that I do not for a moment hold with the abiogenetic or "spontaneous" origin of variola either in man or beast, and am prepared to maintain that whenever and wherever, and in whatever species the disease manifests itself, it is always due to its own special contagium, no matter how this may be conveyed.

It has been stated that cow-pox is now a very rare disease, and that the probable cause for its being more frequent in the days of Jenner was the much greater prevalence of small-pox; thus leading to the inference that the one disease was dependent on the presence of the other. But this statement will not bear close examination. We have no definite evidence to prove that cow-pox was a common disease before vaccination became general, nor yet that it is a very rare malady now; still less that its frequency had any relation to the occurrence of small-pox. We have only the testimony of Jenner, and two or three other observers of the

early part of this century, and they may have witnessed merely local outbreaks, such as occur now and again in different countries. It appears to have been known from time immemorial, and was certainly so in India, Persia, South America, and the continent of Europe long before the time of Jenner. But it had not been studied until Jenner's discovery, and its presence may have often been overlooked, or it may have been confounded with other bovine disorders. Soon after the announcement of the protective influence of vaccination on man, cow-pox was sought for and found at Castres, Nancy, Metz, Strasbourg, and Rambouillet, in France, as well as in various parts of Italy, Prussia, Spain, Wurtemberg, Holstein, Denmark, and elsewhere in Europe. That cow-pox did appear, and that it was, perhaps, somewhat common in that part of Gloucestershire in which Jenner resided, and indeed in many places in England, is not at all denied; but that its prevalence was owing to small-pox being rife, is opposed to all clinical and experimental evidence. Small-pox is transmitted with difficulty to the cow, and does not produce cow-pox, as I have already asserted. If cow-pox was more common a century ago than at present, this may be due to the greater care bestowed upon cattle in their dwellings, and more general good management now than formerly. Dairies are kept cleaner and more wholesome, and people who milk and go among cows are more proper in their own persons then they probably were years ago; consequently if a case of cow-pox does appear, it has not the same facilities for transmission to other cows. This transmission appears to be mainly effected by the milker; the vesicles, being chiefly localized on the udder or teats, are ruptured in the act of milking, and the virus on the dairymaid's hands is transplanted to the lacteal apparatus of the cows she next milks. Sores are frequent on the teats, and the presence of these renders vaccination all the more certain. It is very unlikely that people affected with small-pox would work in dairies, and still more unlikely, if they did so, that they would infect the cows. If cow-pox could be produced through the medium of diseased dairymaids, it ought to be more common now than before vaccination was introduced, seeing the great difficulty with which small-pox is transferred to

the cow (when it does not produce vaccinia), and the readiness with which this animal is vaccinated.

If small-pox could accidentally give rise to cow-pox, surely evidence of this would be forthcoming at the present day, when we have frequent, severe and extensive outbreaks. There are certainly instances recorded of this so-called accidental transmission, observed many years ago, as well as coincident outbreaks of cow-pox in localities where variola was prevalent; but these instances are so very few, and depend, seemingly, upon such a mere chance, that they cannot be accepted as affording reliable proof of the actual possibility of such transmission; while the fact that small-pox prevails intensely over wide districts at times, without variola being observed in the bovine or other animal species, as well as the other fact that cow-pox is observed here and there—individually, sporadically, enzoötically, and even epizoötically—without, however, small-pox being observed, goes far to negative the likelihood of accidental transmission.

That cow-pox may be a less frequent disease in this country than formerly, is quite possible, and, for the above reasons, very probable; though in this respect England would not be an exception, for the veterinary professor, Spinola, mentions that it was a somewhat common malady towards the end of last century all over the German littoral of the Baltic; but to-day it is rare. Like all other diseases of this kind, however, it would appear to have its periods of subsidence and recrudescence. Neumann states that in Holland, in certain years, it was seldom seen, while in others—as in 1805, 1811 and 1824—it was rather frequent. Ritter says that in Schleswig-Holstein it is always present to some extent, but that in some years it assumes an epizootic form and is propagated from herd to herd—as in 1824, 1826, 1829, 1830 and 1832.

Now and again, too, we read of isolated outbreaks in different countries, which attract attention because of the large number of animals affected. The most recent of these is that recorded by Professors Oreste and Sabbatini in 1876 (*Gazetta Medico-Veterinaria*), as occurring among a herd of buffalos, more than two hundred of these animals, young and old, being attacked. The eruption in the cows was chiefly confined to the udder and teats,

but the sucking-calves had it on the nose and lips. The pigs which consorted on the same pastures were not infected. The eruption was typical. According to the *Deutsche Zeitschrift für Thiermedicin* (December 1879), cow-pox appeared as an epizoöty in the summer of 1876, in the vicinity of Reykjavik, Iceland. It had never been seen there before, and caused very great alarm; all the milch cows became progressively affected, and in several instances milkers got inoculated in the hands. Neither in this, nor any other of the outbreaks mentioned above, is any allusion made to small-pox being prevalent in mankind.

In this country we have no means of arriving at any conclusion in regard to the extent to which it may prevail, as no reports are called for by government, and veterinary surgeons are seldom, if ever, required to attend cases of cow-pox, these being usually so trifling. Indeed, it is not at all improbable that many pass unperceived, and those observed are not mentioned by dairy-keepers or milkers, or they may look upon the eruption as analogous to that which is sometimes seen on the teats or udder after parturition. The vesicles are broken, too, almost before they are developed, in the act of milking, and the sores which result are considered to be only simple abrasions or fissures, so common in this region. Therefore it is that there are very few veterinary surgeons, even of those practising in the most populous cattle districts in this country, who have ever seen a case of cow-pox. But we see no reason for thinking that the malady is much less common here than elsewhere—say in Wurtemberg, where the government reports, drawn up by district veterinary surgeons, are very full and complete, and where rewards are offered for every case of cow-pox from which children can be vaccinated. According to Hering, (*Reportorium der Thierheilkunde*), in Wurtemberg, during the ten years from 1827–37, there were sixty-nine cases out of eighty-four which furnished an excellent vaccine lymph, and 152 out of 208 cases in which the lymph did not yield such satisfactory results; making in all about thirty reported cases every year. In 1873, there were thirty-nine cases, from which fifty-two children were successfully vaccinated; the cases were most numerous in April (18), May (13,) and June (8), and one

instance of accidental infection was reported—a farmer's wife who had milked a cow in which the pustules had arrived at maturity, had a vaccine vesicle on the thumb. In 1874, twenty-four cows and four heifers were reported, but complaints are made that the information with regard to these came too late to make many of them available for vaccination—the pocks being either in the last stage, or ruptured, and only sores remaining. Nevertheless, lymph was procured from twelve, and with this twenty-five to thirty children were successfully vaccinated. Some interesting details are given with regard to these cases of cow-pox, one of which was an example of *variola succineæ*. Surgeon Löffler, of Rottenburg, received on April 20th, one of the heifers—a two-year-old animal, twenty-five to thirty weeks pregnant, and very healthy. On the two posterior teats of the right side were three fine pustules, and on the last teat of the left side was another. On opening these a yellowish glutinous fluid escaped. On the 23d, new pustules appeared. The udder and teat were hot, and on the latter were several small and large oval pustules, each with a red areola. When opened there flowed a yellow thick lymph from them; there was a very small quantity of clear lymph at the end. Two children were inoculated by puncture, and an additional quantity of lymph mixed with tepid water, was poured into the wounds. In one child there were developed four perfect and fine (*Vollkommen schöne*) silver-hued pustules, and in the other child one pustule. From these two children five others were successfully vaccinated. Another similar case is related by Dr. Kieser, of Gmünd, in which the cow was three years and a half old, and yielded lymph with which three children were vaccinated, and from these a large number. The details of these cases are full of interest, but I cannot dwell upon them here. I may mention, however, that among the cows were two cases of *V. vacc. nigr.* In 1875, twenty-three cases of genuine, and seventeen of spurious cow-pox were reported. Nine of the former yielded satisfactory inoculations in children, and the owners of the animals were consequently rewarded. One cow was reported to have shown a succession of genuine pox for two years; it was seven years old, and was pregnant with the fifth calf. On the udder, on April 14th

were a number of pustules, from the size of a pea to that of a kreuzer, surrounded by a red border, and containing a partly watery-looking and partly milky-looking lymph. In the course of the next day the pustules became desiccated. On April 24th four new pustules were seen; these soon became encrusted, and were succeeded by others which were merely abortive pustules, and the case continued under observation for some time, not as one of vaccinia, but as one of chronic pemphigus. In 1876 it is again complained that cows were only reported as affected with pock when they became visibly unwell, the secretion of milk diminished, and the teats so swollen and sore that milking was impossible. There were forty-six cases reported, twenty-one of which were genuine, and twenty-five spurious. Successful vaccinations were notified in a number of children, as well as some instances of accidental infection. One of the latter was a girl who daily milked a cow which had calved fourteen days previously; three teats of the animal had sores and pustules on them, and the girl inoculated her nose through scratching it while she was milking. In 1877 it was very prevalent, especially in July and August; in many cases difficulty was experienced in milking the cows, the mammæ often requiring to be relieved artificially, and mammitis being frequently observed as a complication. Several cases were timeously reported, and accidental inoculation of people was noted. In the ambulatory clinic of the veterinary school there were 106 cows affected with ordinary cow-pox during the year, and eleven wtth the tubercular or nodular form (*Knotenförmigen.*) In 1878 thirty-six cows and two calves were reported, but in consequence of reaching them at an unfavorable period, lymph was collected by the district veterinarians from only five cases; this was successfully utilized. The Minister of the Interior had offered a reward of twenty-four marks to owners of cattle for every animal they timeously reported as suffering from cow-pox.

None of the other German States include this disease in their reports. Belgium has issued recently a Health Report of Animals (" Etat Sanitaire des Animaux Domestiques"), published in the Bulletin of the Conseil Supérior d'Agriculture. In that for 1877, I find that at Châtelet there was an outbreak of vaccinia

among dairy cows; but when the veterinary surgeon saw them the attack was subsiding, and on the cows still affected the pustules were either broken or dried up. Before the eruption appeared the cows gave an abundance of milk, and were grazing in the fields. At Wommen a large number of cattle were affected with vaccinia, and the same reporter mentions pigs as being affected with variola in the same district.

Cow-pox appears in the Danish Health of Animals returns; and I observe that in 1875 there were included in the returns twenty-six cases of natural cow-pox throughout Norway, while in 1878 there were reported 581 cases in sixty nine localities, forty-five of these being in Northern Seeland. They occurred as in other countries, all the year round, but were most numerous towards September.

I have taken the liberty of bringing forward this evidence to prove that cow-pox is not an extinct disease; that the chance cases reported in such small countries as Wurtemberg, Belgium and Denmark amount to a considerable number in the course of the year; that there is ample clinical and experimental proof that the malady is really vaccinia, and has no relation whatever to human variola; that the presence of the disease in isolated cases or in a sporadic condition, gives it the power of assuming an epizootic form when circumstances permit; and that, although it is more or less denied that cow-pox exists in this country, there is every probability that it is at least quite as common as in Wurtemberg, though perhaps less so than in the days of Jenner.

With regard to the localisation of the disease in the cow, it is quite true that the mammæ and teats are the special seat of the eruption, just as the mouth, lips, and limbs are the ordinary situation of the horse-pox. Nevertheless, cases now and again occur in which, as also in the horse, the eruption is not limited to the usual parts, but appears on the muffle, nostrils, and other regions where the skin is thin and the hair scanty. Pilger D'Arboval and other veterinarians testify to this, as also do the Wurtemberg reports. But the eruption is very far from being general over the body, even in these instances.

The female sex of the animal has been brought forward as an

argument in favor of cow-pox being communicated by the hands of persons affected with small-pox. But it is quite forgotten that there are more cows than bulls or bullocks; that they are generally completely under observation in cowsheds; that when in milk their teats are constantly handled, and therefore the eruption can be felt and seen, while inoculation from cow to cow is made all the more easy, and the disease, consequently, much more diffused than it would otherwise be. With the bull or the bullock, on the contrary, there are none of these opportunities for observation or extending the contagion. The bull is seldom in deed with the cows, and then only for a brief period; while the parts which might be the seat of eruption are rarely handled, and perhaps never examined. The bullock is still less, perhaps, exposed to contagion or submitted to examination. But I entertain no doubt whatever that both the bull and the bullock do suffer from vaccinia, and it is quite ridiculous to imagine they do not. Male bovines have been largely employed in vaccination experiments on the Continent, and the vaccine lymph has acted as promptly and effectively on them as on the cow. At Bâle, the veterinarian Sigismund for a long time furnished the vaccinators with lymph cultivated on bulls which were intended for slaughter; he inoculated them on the scrotum. Chauveau has also successfully vaccinated bulls, and so have other experimenters. Roloff, of the Berlin Veterinary School, has demonstrated how easily the bull could be infected. He slightly abraded the skin of the scrotum, and gently rubbed the vaccine lymph upon it; the characteristic eruption took place in due course. If bulls or bullocks stood in cattle-sheds with an equal number of cows, and were treated and exposed to contagion in the same way as these, there is every probability that we should have bull or bullock-pox frequently enough. Where this association is allowed to take place on the Continent, bulls and bullocks are infected. An interesting case of this kind is recorded in the *Repertorium für Thierheilkunde* for 1879. A bull two-and-a-half years old, is there described as affected with vaccinia, the pustules and crusts being situated on the scrotum, a hind and fore foot, and lips. The animal suffered a good deal. The lymph from the

pustules was employed with success in the vaccination of children. So that it is simple nonsense to assert that the male bovine is exempt from vaccinia; and it betrays ignorance of what has been observed by competent men, as well as lack of knowledge of pathology in general and this disease in particular.

(*To be Continued.*)

EXTRACTS FROM FOREIGN JOURNALS.

SUPPURATIVE BRONCHITIS IN A PIG, PRODUCED BY SPORES OF TILLETIA CARIES.

The majority of the diseases lately attributed to the spores of tilletia caries have had for their seat the mucous membrane of the digestive apparatus. (See Drs. Albrecht, Koch, &c.) In some cases, the simultaneous existence of a catarrhal rhinitis has been observed, and in another mention has been made of a special action exercised by these spores upon the uterus (Gerlach).

No notice of any alteration attending the lesions produced by their action upon the mucous of the bronchia has yet been published. Berndt thinks that the publication of the following case may be of interest.

Called the third day of August to examine a pig which had died, he found that the animal had lost its appetite for the last eleven days, and had since suffered from diarrhœa, very severe towards the last days, and then becoming complicated with dyspnœa.

At the post mortem, the skin and muscles were found normal, the stomach contained a small quantity of a yellowish viscous fluid; the gastric mucous membrane presented near the cardiac portion an inflammatory redness, and towards the pylorus erosions appeared of various sizes, with also slight infiltration. A grey-yellow fluid formed the contents of the intestinal canal; the mucous of the larynx and trachea presented catarrhal lesions, the trachea being in different parts the seat of erosions of different sizes.

The anterior half of the pulmonary lobes had a greyish-red tint and was somewhat firm; these altered parts of the lungs sunk in water. On a surface of a section of the atelectasic parts of the lung, were seen numerous yellowish spots surrounded by a clear zone quite distinct from the surrounding parts. The yellow center of these nodosities could be easily removed, and when of certain dimensions,they would leave little depressions with smooth walls. The surface of a section made through the parts of the lungs closed to the bronchia (large or of medium size) presented the same characters.

Fresh sections of the little spots, examined with the microscope, showed the larger and smaller bronchiæ to be the seat of peculiar alterations. The walls of the bronchial and the peribronchial connective tissue were sclerotic and formed the clear zone which surrounded the spot mentioned above.

The cavity of the bronchiæ was filled with epithelial and round cells—detached white blood cells—separated by quite large corpuscles; these cells were of a brown color and had a star shape. The corpuscles were abundant in a fresh section and always presented the same sharp form.

The parenchyma of the lung was atelectasic behind the bronchia obliterated by the masses of cells. Upon the tracheal mucous were also seen numerous spores of tilletia, especially upon the ulcerated spots.

The contents of the intestines were not examined with the microscope, but on the food and bedding of the patient, numerous vegetations of tilletia caries were found. No doubt, the spores of this fungus were the cause of the suppurative bronchitis.—*Annales de Belgique.*

FORM OF RABIES DEVELOPED IN A DOG AFTER GREAT EXCITEMENT.

In May, 1871, during one afternoon, a dog of quiet disposition had played with the children of his master, who excited him and made him run until he was entirely exhausted. The next day he was shown to Mr. Cagny, Veterinary Surgeon. He found the dog dull, very irritable, lying back in its kennel, and without

appetite. Putting aside the suspicion of hydrophobia, a diagnosis of over-fatigue was made; still the general condition of the dog remained the same, and the physiognomy of the patient became suspicious. A neighboring dog irritated him by its presence and had to be taken away. One day he bit his master, and was killed.

Was this a case of spontaneous rabies or a rabiform nervous affection? No rabid dog had been near the place for over a year; the other dog which was bitten by him never had rabies, and the owner never suffered from the bite he received.—*Recueil de Medecine Veterinaire.*

INDIGESTION IN A HORSE. ANTE MORTEM RUPTURE OF THE DIAPHRAGM AND POST MORTEM LACERATION OF THE STOMACH.

Mr. Ladague was one night called to see a horse suffering with colic, and received the following history of the case.

Eight days previous the horse had had a slight colic, which lasted an hour and a half. Since then he had worked on the farm with the other horses. During the day he had eaten about ten pounds of hay, and in the evening a good ration; what quantity is not known. At half past nine he showed colicky pains, pawing and lying down and getting up easily, and when down remaining flat on his bed. From the moment he was taken, to the arrival of Mr. L., he had assumed the dog sitting position three times. Mr. L. found him standing, with face contracted and eyes injected, nostrils dilated; legs spread apart; no tympanitis; pulse, hard, 61; respiration, 26; frequent gaspings. Diagnosis: stomachal indigestion. Treatment: bleeding; drench of alcohol, acetate of ammonia, &c.; frictions; walking exercise.

An hour later he passed manure in small quantity and micturated. Returned to his stable, he occasionally laid down; no vomiting; assumed the dog position seven or eight times, and died in the morning while lying on the right side.

Post mortem the next day showed the abdomen very tympanitic; intestines full of gas; small one highly congested along over two yards of the posterior part of the floating portion; no invagination, volvulus or strangulation. The stomach was of

enormous size, weighing about forty pounds, and presented a laceration in the middle of the posterior face of the right cul de sac, about ten centimeters from the great curvature and parallel to it. The edges of the laceration were bloodless, clean and without ecchymosis. The contents of the stomach had passed through the opening into the abdomen.

The stomach being removed, a very irregular laceration of the diaphragm was found, beginning a little above the foramen of the right pillar of the muscle, somewhat to the right, and running down through the left pillar. It was at first horizontal and then extended obliquely upwards. The section of the fleshy part of the right pillar was complete and irregular. The edges presented little blood clots and ecchymostic spots. A similar condition was found on the fibres of the left pillar and through those of the phrenic center, which were also torn. Some portions of those, however, were also bloodless.

The case was thus proved by the post mortem to have been rupture of the right and left pillars of the diaphragm, before death, which was increased by the formation of gases in the abdominal organs, which gases also produced the laceration of the walls of the stomach after death.—*Recueil de Medecine Veterinaire.*

CONTRIBUTION TO THE STUDY OF THE TRANSMISSION OF TUBERCULOSIS.

By M. H. Toussaint.

Veterinary pathologists agree in admitting that tuberculosis is unknown or at least very rare in pigs. This however, is not due to an inaptitude in that animal to contract the disease. The experiments of Mr. S. Cyr, in 1874, repeated since by several other pathologists, show evidently the facility with which the tuberculous infection takes effect in pigs. While nothing is more common in slaughter-houses than tuberculous organs of oxen or cows, one will look in vain for tubercles in a pig.

To what cause may these differences be attributed in animals

which are so readily infected by experimental methods? The experiments I am about to relate may answer this question.

First Series.—Three pigs, six to eight months old, were used. They had been kept for five months in the yards attached to the laboratory, and were in good health, large and fat. They were numbered 1, 2, and 3.

On the 29th of September, 1879, No. 3 was placed apart, and Nos. 1 and 2 were fed with the entire lung of a tuberculous cow, obtained from the abattoir, and containing a great quantity of tubercles. It was devoured with apparent relish by both animals.

Two days later, the yard being well washed, No. 3 was allowed to return to it. No. 2, a sow, was placed in a special lodge by herself, as she was advanced in pregnancy, and eighteen days later was delivered of a litter of five little ones, of which she crushed four, on which no post-mortem was held.

No. 1 was killed seventy-seven days after eating the tuberculous lung. During the last month he had lost much flesh, and the post-mortem revealed an advanced state of general tuberculization. The ganglions were hypertrophied, the soft palate ulcerated and all the organs and serous membranes of the splanchnic cavities were covered with tubercules.

No. 2, the sow, died in a very lean condition, one hundred and one days after the tuberculous meal. There was ulceration of the soft palate; a cretaceous condition of all the lymphatic glands; mammæ were full of tubercules, and all the parenchymatous organs, abdominal and thoracic, were filled with calcareous tuberculer deposits.

No. 3, the little one of the above sow, died the same day. He was tuberculous, but the lesions were less advanced. He showed, besides, extensive pulmonary hepatization.

No. 4, the one which was first with Nos. 1 and 2, remained fat. He was killed after one hundred days of cohabitation. He showed a beginning of tuberculosis, limited to the maxillary and bronchial ganglions, with some granulations in the lung. In this case it seems certain that the transmission had taken place through the common feed rack.

Second Series.—No. 5. On the 18th December, a young pig

was given a portion of the lungs and ganglions from No. 1, and was killed after twenty-three days. There was nothing apparent on the surface of the organs, but the maxillary ganglions were hypertrophied, and under the microscope exhibited tubercular granulations in their first period of formation.

No. 6. On the 18th of December, tubercular ganglion was taken from No. 1, and a portion of it cut off and crushed and filtered through cloth. One cubic centimeter of this solution was injected into the left side of the soft palate. Fifty-seven days later, the left maxillary ganglion was enormous, while that of the opposite side was scarcely tuberculous. All the organs were full of tubercular granulations, some of which were white on the centre.

Third Series.—No. 7. On the 11th of January, 1880, the remains of No. 2, which died the day before, were given to a young pig. On the 10th of February the maxillary ganglions had become voluminous. On the 26th of March the animal was in extremis. When killed, it was found in the last period of generalized tuberculization. The soft palate was tuberculous.

No. 8. On the 11th of January, 1880, a pig two months old was subjected to experiment. Some of the blood from No. 2 was injected under the skin. It was followed by an irregular, hard and tuberculated tumor. Sixty-one days after, it was killed, and tubercles were found on the skin and the ganglions, and numerous gray granulations on the pleura, the lungs, liver, spleen and omentum.

To resume, these experiments show that the lesions of the pig belong to acute tuberculosis, and that they prove fatal in a short time, usually a few weeks. Tuberculosis of the pig is analogous to hasty consumption in man. The bovine family, on the contrary, is subject to chronic tuberculosis. From this, it results that young pigs, coming from tuberculous parents, offer but little resistance to the disease and die young; and that in adults which become tuberculous, the rapid march of the disease prevents reproduction.

In the point of view of contagion, these facts prove also that tuberculosis is easily transmitted, 1st, by the injection of tubercu-

lous matter; 2d, by heredity or nursing; 3d, by inoculation of the tuberculous matter or of the blood; 4th, by simple cohabitation.

In a future note I will show that the infection, in the case of injestion or of contagion, takes place through the mouth.—*Academie des Sciences.*

ON THE ANATOMICAL CHARACTER OF BLOOD IN PHLEGMASIES.

By M. G. Hayem.

The study of the anatomical alterations of the blood, and especially of the evolution of those alterations, shows that the principal morbid stages have, so to speak, a special hematic character, the knowledge of which may be used in the diagnosis and prognosis of a certain number of diseases.

My attention being particularly called to the connections existing between the modifications of the hematoblasts and the formation of the fibrinous reticulum, I observed that the microscopical examination of the process of coagulation furnishes numerous instructive facts quite as positive as the dosage of the fibrine by chemical means.

To speak first of the phlegmasies, we shall be called upon to distinguish, 1st, the modifications in number of the elements of the blood, and, 2d, of the qualitative alterations which occur in it

The present note will treat only of the variations in number.

I. *White Corpuscles.*—In the normal state the number of the white globules is in proportion specially to the age of the subjects.

In the woman the number is the same as in man, but it generally increases from 1,000 to 2,000 during menstruation.

It is to be understood that in all phlegmasies the number of white corpuscles is increased. This varies; out of 65 observations it oscillated between 7,000 and 36,500. The first figure was observed in a mild case of erysipelas of the face, almost aperytical; the second in a case of double caseous pneumonia, with vomica. Most commonly, the number of white corpuscles is from

15 to 20,000. It is, therefore, threefold and quadruple more than in a normal state. One may say, generally, that it is greater, as the disease is more truly inflammatory, whether it is idiopathic or symptomatic.

Relatively to the march of this phenomenon, the following facts are observed:

1st. The increase of the number of white globules takes place from the beginning of the disease and reaches, regularly or by degrees, a maximum which corresponds to the period of maturity of the affection; that is, for instance, with the suppuration in cases of suppurative inflammation.

2d. In decreasing phlegmasies, the number of white corpuscles diminishes in following closely the march of the disease.

3d. In suppurative inflammation, it diminishes immediately when pus comes out to the surface, to increase again when this is followed by secondary suppurative process.

4th. In the beginning of convalescence from truly acute forms of disease, one often sees, for a variable length of time, though short, (one, two, three days), the number of the white corpuscles diminish sensibly below the normal, before reaching definitely the physiological average.

This augmentation does not exclusively belong to acute phlegmasies with rapid evolution. If in these conditions it reaches its highest development, it nevertheless remains well marked in subacute and chronic affections, whether they be suppurative or only parenchymatous.

II. *Hematies.*—The numerical variations of red globules in phlegmasies depend on various conditions, and are, consequently, so irregular, that it is difficult to include them in a general description. One may say, however, that acute inflammation of eight or ten days' standing (pneumonia for instance) produces almost always a loss of from 200,000 to 1,000,000 of red corpuscles for one cubic millimeter. But this estimate is not absolute, as it could not be made out before the return of the number in perfect health.

It is at the moment of effervescence that the number of hematies reaches its minimum. It increases irregularly and more or

less rapidly during convalescence. At that time it is not rare to see it reach a very high figure, to be subsequently reduced.

When the phlegmasy is truly acute, and followed by rapid recovery, the number of hematies returns to its physiological standing in a few days. This numerical repair occupies a longer period after serious and protracted phlegmasies. It aborts when the acute is succeeded by a sub-acute or chronic stage. Even in these conditions one may observe a more or less marked anemia; in sub-acute articular rheumatism, for instance.

III. *Hematoblasts.*—The number of these, which normally is 255,000, is little modified during the period of acute phlegmasies with rapid evolution. In true pneumonia, it is generally a little above the normal number, while in most other inflammatory diseases it remains below, or scarcely reaches it. In general, the longer the disease, the smaller the number of hematoblasts. It may come down to 100,000, or even 75,000. It is towards the end of the phlegmasie that it reaches its minimum.

Then suddenly appears a rapid and progressive increase of the hematoblasts, an important and constant fact, which constitutes the most prominent and characteristic of the phenomena presented by the enumeration of the elements of the blood. In two or three days (in truly acute cases) the number of these corpuscles reaches a maximum twice, three, and four times that of the normal figure. This accumulation of hematoblasts, which by its intensity and constant presence constitutes a kind of hematical crisis, takes place at the time of effervescence; it begins when the temperature comes down.

It is intimately connected with the evolution of the lesion, and is observed as well in fatal cases as in those followed by recovery, provided the inflamed part enters into resolution.

It is equally so when the disease has several successive inflammations, each of the lesions terminating by an abundant production of hematoblasts.

At last, in cases where the disease has a slow march and a tedious effervescence, the increase of the number of hematoblasts takes place by successive steps, and it never reaches its maximum before a great number of days.

This important phenomenon corresponds with the diminution in the number of the white corpuscles; it is temporary, and is soon followed by the formation of new hematies.

In these circumstances, the return to its normal course ought to be considered as the consequence of a temporary accumulation of fresh elements at the time when the blood-evolutions have been stopped by the pathological process. This accumulation remains noticeable until the return of the equilibrium between the transformation of the hematoblasts into hematies and the production of new elements.—*Academie des Sciences.*

REPORTS OF CASES.

TRAUMATIC LESION AS AN EXCITING CAUSE IN THE DEVELOPMENT OF THE SYMPTOMS OF GLANDERS.

By A. Liautard, M.D., V.S.

The following cases are reported as being not only interesting in themselves, but also as showing the influence that traumatic lesions may exercise in the development of the external manifestations of glanders. Apparently in good health and able to perform their duties until they were submitted to surgical operations, the animals in question broke under the disease but a few days after they were operated upon, and that without exhibiting any suspicious symptoms until all the manifestations had become well marked. Still, there were in their history points to which I think particular attention ought to be called, and that in similar circumstances the practitioner will do well to bear them in mind.

A point in the first case is the species of the animal and her previous history, which might be considered as suspicious. In the second, the fact of the animal coming from a stable where glanders had been found a month before, and in each the fact of their having been kept in a large stable down town, and in that part of the city where glandered horses are likely to be mingled with others whose diseased condition had been undiscovered or overlooked.

Case 1.—Fibroma of the Shoulder Joint—Acute Glanders. On the 12th of February, 1880, a grey mule about 12 years old, kept in a poor stable down town, was brought to the hospital of the American Veterinary College for treatment. She had, on the right side at the base of the neck near the point of the shoulder, a large tumor. It was round, with somewhat well defined borders, hard and smooth; and beyond the fact that it had been submitted to several forms of treatment, which rendered the animal timid and sensitive, the handling of the tumor seemed to be painless. This swelling was not of recent date, and the mule had been treated for it several times, with the same result, viz., that the enlargement after some time always reappeared. Apart from this condition, the animal seemed to be healthy.

Looking at the case as one of fibroma, the removal of the tumor was advised and performed on the next day, the animal being thrown on the left side. The operation was quite simple. An incision was made lengthwise along the middle of the tumor; the skin was carefully dissected and the tumor well isolated. At the last stage of the operation, and as the mass was about to be removed, a small cavity on the center of the tumor was opened and the escape of about a teaspoonful of thin pus followed. The edges of the wound were brought together with quill sutures.

The animal was placed on good diet and the wound dressed daily with carbolized dressing. The suppuration was fairly established towards the fourth day, but it remained of thin watery character, yellowish in color. The granulations of the surface of the wounds were of a pale red color, flabby, and liable to bleed upon being touched.

About the 18th, the mule seemed to have a little cold; her temperature rose to 103; she coughed some and discharge appeared from both nostrils. On the 19th her appetite had diminished; the discharge of the nose was of a gluish, bad character, and the maxillary glands had become swollen. On the 20th, in the morning, her respiration became labored; bloody discharges were abundant from both nostrils; the lower part of the maxillary space much swollen and painful; farcinous cords appeared on both sides of the face on each cheek, and the septum nasi was

covered with ulcerations characteristic of acute glanders mixed with some having a more chronic character.

Case 2.—Fracture of the Lower Maxillary Bone—Chronic Glanders. On the 14th of June a grey mare well advanced in years, belonging to a trunk establishment, was brought under my observation.

About a month before, a black horse belonging to the same firm had been condemned for glanders. Her history is incomplete. She is said to have been first observed that morning with the lesion which she presented. She then showed a punctured wound on the left cheek, at the maxillary tuberosity, measuring about one inch and a half in length on the outside, and quite dry. On introducing the finger into the puncture, a number of pieces of bone could be felt, some loose, others adherent to the torn muscles. The pus, which flowed freely, was quite good in character. The hand, resting on the upper part of the flat of the cheek a little below the temporo-maxillary articulation, received the sensation of crepitition when the jaws were put in motion, as by the introduction of the finger in the mouth and the tickling of the palate. The lymphatic glands of the maxillary space were not swollen. There was no discharge from the nose. The mare ate well and seemed not to suffer from her injury. Her temperature was above the normal and remained so during the whole duration of her sickness, varying between 102° and 103°.

The treatment consisted in the removal of all the loose pieces of bone and the cutting away of those that were adherent to the muscles. The wound was dressed with carbolized dressings.

Every thing went on well, the wound became smaller, the discharge improved, the wound was much reduced in size, the animal fed well, until the 29th, when at my morning visit she was found breathing with difficulty and discharging from the nostrils; the glands had become swollen, and ulcerations had made their appearance on the septum nasi. She was immediately destroyed.

At the post-mortem, besides the lesions of chronic glanders found in the head, the inferior maxillary was found fractured. The injury of the jaw was as follows: A large piece of the maxillary was removed, involving the whole thickness of the maxillary

tuberosity and nearly one-third of the plate of the branch of the bone on that side, the upper portion of the fracture being pushed inwards and extending upwards by a split of the bone towards the corono-condyloïd notch.

Case 3.—Caries of the Occipital and Atlas.—Poll Evil—Chronic Glanders.—On the 9th of July a bay gelding of 10 years of age, used as a truck horse, was brought to the hospital of the college. He was kept in a stable down-town with a number of other horses, and had never missed his work.

On going out of the stable that morning, it was observed that the head was swollen, the swelling extending down the lips, over the eyes, the parietal region, in the maxillary space, over the poll, and to the axis, where it stopped short. The glands of the maxillary space were quite painful. No cause could be given for that condition, as no local injury could have been inflicted in the stable. His temperature was 102, pulse 50, respiration 16. A dose of physic was given on the 11th, and local applications made to the poll. The animal seemed in great pain. He carried his head low down, bending it from side to side, and showing symptoms of immobility. On the 14th, the abscess of the poll was freely opened on the left side, and yellow, thick pus escaped freely. Through the opening, the middle portion of the external face of the occipital bone could be felt, rough and denuded of periosteum. On the 15th, the temperature was 103, appetite poor, and little cords of a farcinous character made their appearance on each of the cheeks, running parallel to the anterior border of the masseter muscles. The swelling of the lower part of the head had considerably diminished. On the 16th the face had ulcerated in two or three places, and another large abscess had opened on the poll. His appetite remained good. On the 18th, large farcy buds and cords showed themselves on the left side of the neck. A bloody discharge took place from each nostril; one small ulceration was formed on the left side of the septum nasi. On the 19th, all the symptoms of glanders were well defined, and he was destroyed the same day.

The post-mortem of the head showed all the lymphatics filled with small abscesses, and the maxillary ganglions engorged. The

septum nasi on both sides, especially the right, presented the characteristic chancres of chronic glanders, some of them, however, having a more marked acute appearance. The turbinated bones presented also some calcareous deposits, with here and there little ulcerative spots. The occipital bone, on both its external and internal, and the atlas, when boiled, presented beautiful lesions of caries, extending over their external surface.

In neither of these cases was a post-mortem examination made of the respiratory apparatus.

CORRESPONDENCE.

QUESTIONABLE OPERATION.

By E. Mink, Rochester, N. Y.

Editor of Veterinary Review :—

To-day I read in *The Archives of Comparative Medicine and Surgery*, July number, 1880, pages 168 and 169, the report of cases one and two, diagnosed as fibroid tumors, and found to be such after operations. I noticed that in case one the tumor weighed five and a half pounds, microscopical report not rendered; and further, it is not stated that the interior of said tumor was examined for abscess of inspissated or liquid pus, neither is there any thing said about such examination in case two. Now it occurs to us that it is probable from the history of these cases, that both the tumors were merely walled-in abscesses or fibrous tumors, such as are described by Williams in his "Surgery," on page 397. If so, the operation of removing the entire tumor was wholly unnecessary, and would be practised in such cases only by a novice in the veterinary profession.

Many years ago, and long before we saw even Williams' work, we were called upon to deal with such tumors. In our verdancy, in 1860, we dissected one out located in about the same region as described in case one. It was about the size of a large goose egg. After removing it we examined its interior and found it contained

a small abscess not much larger than an acorn. We then concluded that its entire removal was unnecessary, and that it should have been thoroughly explored first with either needle, trocar or knife, for abscess.

From that time to this, I have been called to treat many such tumors, some quite as large as described in case one, and in every instance where pus could be found by exploring, I have simply cut down upon the deeply walled-in abscesses, liberating the imprisoned pus, and then injecting some stimulant or caustic to destroy the walls of the abscess or to cause adhesive inflammation of the same. And in all these cases (after having been thus treated), I have found these large tumefactions to gradually but surely disappear, proving, as I think, the tumors to consist largely of exuded lymph and hypertrophied tissues.

By excision, important portions of muscular tissue are removed which may ever after interfere with normal muscular action.

By the method of treatment last described, the integrity of muscular tissue is completely restored in a comparatively brief space of time.

Rochester, N. Y., July 20, 1880.

SUICIDE IN A HORSE.

By W. L. Zuill, D.V.S.

Editor American Veterinary Review:

Dear Sir:—Having been requested to make a report of the following case, I beg leave to do so, as I think that the anatomical lesions found on post mortem examination may prove interesting to the readers of the American Veterinary Review. For the want of a more appropriate cognomen, I am inclined to call this case one of suicide, and, although self-inflicted, can not discover that it was in accordance with the will of the animal.

This accident happened on the 27th of April, 1880. The animal was a bay horse, eight years old, the property of Wm. I. Taylor of this city. He had just been fed his usual allowance

of oats, of which he quickly disposed, and then began a vigorous assault on his mate by kicking, which was so effective as to break from the stall a wedge-shaped piece of plank which fell against the animal, frightening him. In his endeavor to rid himself of the nuisance, he caused the sharp point of the broken plank to penetrate the umbilical region of the abdominal parietes a little to the left of the median line, passing upward and forward to a distance of thirty-eight or nine inches and about thirteen inches wide, making a lacerated wound sufficiently large to admit the passage of a man's hand quite easily. The groom not being able to render the animal any assistance alone, ran out for help; on returning found him standing perfectly quiet, the piece of plank having fallen out, followed by the whole mass of small intestines, nearly to the floor. I was immediately called in, and on seeing the case ordered the animal to be relieved of his sufferings, which were being increased by the animal constantly trampling on the intestines, every step bringing down more and more of the abdominal viscera.

On post mortem examination, the small colon was found to be completely severed, and its mesenteric attachment, together with that of the small intestines, entirely destroyed; the whole mass protruding through the wound made through the abdominal walls. The stomach was divided more or less completely, and its contents discharged into the abdominal cavity and from the wound; the liver was somewhat injured, and in the diaphragm a more or less circular lacerated wound about six inches in diameter. On examining the thoracic cavity, considerable damage was found to have been done to the lung tissue on the left side; the thoracic pleura and internal muscles suffered considerably. I was at first surprised at the very slight amount of hemorrhage which had taken place, but afterwards considered the nature of the wound to be sufficient explanation for the case. Hoping not to trespass on your valuable time and space,

I am, yours respectfully,

W. L. Zuill.

1513 Race St., Phila.,
July 17th, 1880.